



ZAAB

ZAMBIA ALLIANCE FOR AGROECOLGY AND BIODIVERSITY

GMOS ARE NOT THE WAY TO GO FOR ZAMBIA

A fact sheet from the Zambia Alliance for Agroecology and Biodiversity (ZAAB) on the concerns surrounding genetically modified organisms and Zambia's changing approach.

Two decades ago genetically modified (GM) crops were introduced onto the world market. The move ignited global debate about their human and environmental safety, as well as impact on agricultural systems and the socio-economic well-being of farmers. The debate continues, with those who are for the technology insisting that genetically modified organisms (GMOs) are safe and beneficial. Those who are cautious, point to an ever-growing body of evidence that the risks of

GMOs have far outweighed the benefits. Looking back over 20 years of GMOs, evidence is showing that:

- GMOs pose health risks
- GMOs bring environmental risks
- GMOs are not appropriate for smallholders
- GMOs contribute to corporate control of the food system and hunger; and
- GMOs restrict access to markets.

Over the decades, Zambia has been a pillar of strength and an exemplary model on biosafety in the region, but is finally bowing to massive pressure to destroy its high regulatory standards. This fact sheet looks at the realities of GMOs today and why we should be concerned about Zambia's changing approach.

1. BACKGROUND

AFRICAN LEADERS WERE AT THE FOREFRONT OF A CAUTIONARY APPROACH TO GMOS

African leaders were at the forefront of the global negotiations that resulted in the United Nation's International Biosafety Protocol¹. The Protocol came into force in 2003 and Zambia became a Party in 2004. The Protocol defines GM as different to conventional breeding. It acknowledges that scientists still do not understand the long-term risks of this new science. It lays out special risk assessment procedures for GMOs (called biosafety). It lays out the procedures for governments to give permission to allow GMOs into the country, the environment and the food system.

The biotech industry claims that humankind has been modifying seeds for thousands of years and that GMOs are not new or more risky. 168 governments have signed the Biosafety Protocol, showing that they disagree. 42 of these are African, including Zambia.

African leaders fought hard to ensure that the Protocol was based on the "precautionary principle", which allows them to say no to GMOs if they are worried about safety. They also wanted authorities to look at how each new GMO could impact on culture and livelihoods during GMO risk assessment. Additionally, they insisted that the producers of GMOs must be responsible for the costs of damages GMOs might cause – this is called liability and redress. The precautionary principle was included in the Protocol. The other issues have taken decades of negotiation with less successful outcomes.

In 2003 the African Union (AU) also drafted and adopted the African Model Law on Safety in Biotechnology. The AU encouraged African governments to use this guideline when they developed their national GMO Acts. The AU model law sets higher safety standards than the International Biosafety Protocol and takes the unique characteristics of African agricultural systems into account.

It is important to note that the United States is not a Party to the International Biosafety Protocol. Instead, the US has a long history of trying to weaken the Protocol, because taking a new product through the safety regulations is expensive for GMO producers, and may also result in rejection if biosafety authorities feel that the product is not safe. Over the years, USAID has helped African governments to develop their GMO Acts and laws by giving financial and technical assistance. The laws they have helped to develop are designed to create easy passage for GMOs into Africa and to protect GMO producers from taking responsibility for damages that might occur. This has weakened Africa's strong precautionary approach to GMOs.

ZAMBIA'S LONG HISTORY OF CAUTION

In the face of unprecedented political pressure, Zambia has until recently, maintained a strong precautionary stance toward GMOs, showing an iron will to protect farmers, environment and the integrity of Zambia's food. This is reflected in the exemplary Zambian Biotechnology and Biosafety Policy (BBP) of 2003 and Biosafety Act of 2007. These clearly prioritise the safety and well-being of Zambian citizens over the wishes of the biotech industry.

In 2002 the Zambian government famously refused GM food aid from the USA in the midst of a bad drought. The government faced fierce backlash for its decision. The US Ambassador to the United Nations Food and Agriculture Organisation (FAO) even called for Zambia's leaders to be tried in "the highest courts in the world" for "the highest crimes in the world". However, the Zambian government asserted that the risks of a famine were being overstated and focused instead on cassava, stockpiles of local maize and imported grain. The government stated that not a single person died as a result of the decision to reject the GM food aid. In 2003 Zambia went on to produce a bumper crop, even managing to sell maize to the World Food Programme, which was sent on to Zimbabwe, Angola, Democratic Republic of Congo and Namibia.

1. Cartagena Protocol on Biosafety to the Convention on Biological Diversity

The political pressure to weaken Zambian safety regulations and create an easy environment for GMO producers has continued until today. The biotech industry is now lobbying hard for changes to the Biotechnology and Biosafety Policy. Changes to the Biosafety Act are also planned. The biotech industry claims that Zambia's

strict laws on liability and redress must be relaxed or removed before they can begin GMO experiments. This is because scientists and GMO companies do not want to be responsible for the costs of damages that might arise from GMOs.

WHAT GMOS ARE GROWING IN AFRICA TODAY?

Only 5 African countries have ever allowed the cultivation of a GM crop. South Africa is the only country that is cultivating GM food crops.

GMOS BEING CULTIVATED:

- South Africa: Cotton, soya, maize (since 1997)
- Egypt: Bt maize 2008 (approval given but cultivation never went ahead due to legal problems)
- Burkina Faso: Bt cotton 2008. Withdrawn from the market in 2017 due to intractable quality problems
- Sudan: Bt cotton 2012
- Nigeria: Bt cotton 2016 (approval but cultivation has not yet begun)

A number of African countries are currently running field trials and applications for commercial release are pending, mostly for cotton. Applications for commercial release of GM cowpeas are pending in Burkina Faso, Ghana and Nigeria and field trials are running in Malawi. Other crops being experimented on include banana, cassava, rice, sorghum, sugarcane, sweet potato and Irish potato. Genetically modifying indigenous crops, and crops that are important for food security, is extremely worrying. If these crops must be bought annually or if they may not be saved or shared, an important source of nutrition will be lost.

2. WHAT ARE THE CONCERNS ABOUT GMOS?

- GMOs pose health risks
- GMOs bring environmental risks
- GMOs are not appropriate for smallholders
- GMOs contribute to corporate control of the food system
- GMOs restrict access to markets

GMOS POSE HEALTH RISKS

There is a gap in the scientific literature on long-term testing for the safety of GMOs. No independent safety tests are required by authorities. Research by independent scientists have highlighted worrying issues that deserve further research, including:

- Effects on gastro-intestinal tract: Inflammations, ulcerations and excessive growth of stomach and gut lining;
- Disturbance of liver, pancreas and kidney function;
- Disturbance of testes function (male function);
- Alterations in blood composition;
- Allergic reactions and immune responses;
- Impacts on second generation.

Nutritional changes:

- Altered level of existing, or presence of new toxins;
- Altered level of existing, or presence of new allergens;
- Altered level of existing, or presence of new anti-nutrients (these stop nutrients from being absorbed by the body);
- Altered level of existing nutrients (e.g. vitamins).

THE CHEMICALS SPRAYED ON GMOS ALSO POSE HEALTH RISKS

Glyphosate (more commonly known as RoundUp) is used on most herbicide tolerant (HT) crops. The World Health Organisation's (WHO's) International Agency for Research on Cancer (IARC), categorises glyphosate as a class 2A carcinogen – in other words, it probably causes cancer. As weeds are developing resistance to glyphosate, other poisons are being sprayed to deal with weeds, including dicamba, 2,4-D and glufosinate. GMOs are increasing the use of toxins and these are ending up in our soil, water and food. Farm workers are also at great risk as they are directly and regularly exposed to these poisons.

GMOS BRING ENVIRONMENTAL RISKS

GMOS DISRUPT THE FOOD WEB:

GMOs can disrupt the entire food web, impact on aquatic systems as well as create new weeds, secondary pests and resistant pests. GMOs can have a negative impact on pollinating insects, such as bees, when they feed on GM crops. GMOs can disturb the balance of pests and predators in the field, negatively impacting insects that are 'farmer's friends', such as ladybirds and lacewings. Negative impacts have also been found on moths and butterflies. Additionally, it has been found that Bt genes from GM crops disrupt the food web in the soil. Ecological health begins in the soil as it is the most vital source of nutrients for plants.

INSECT AND WEED RESISTANCE:

Pests and weeds naturally develop resistance to toxins over time, and usually farmers must change and break their chemical spraying regime to prevent this. In Bt crops, where the plant is the pesticide, there is no break in exposure so pests develop resistance quickly. The maize stem borer started developing resistance to Bt maize in South Africa within ten years, leading to the withdrawal of one of Monsanto's Bt crops from the market – MON810. Other African countries are now waiting for approval of the same MON810, which is essentially already out-dated technology.

Overuse of glyphosate (better known as RoundUp) has led to herbicide resistant weeds that are now extremely difficult to get rid of. About 60 million ha of American

agricultural land is infested with these "super weeds". Because the glyphosate no longer works, new HT crops are tolerant to multiple herbicides, including glyphosate, glusophinate, 2,4-D and dicamba. Far from decreasing pesticide use, GMOs have caused greater volumes of chemicals to be used and all sorts of new cocktails to be sprayed. These volumes are contaminating water sources leading to higher than permitted levels of herbicide in drinking water. In the US, farmers that are NOT using HT crops are suffering massive damages caused by chemical drifts, particularly of dicamba, from their neighbours.

CONTAMINATION OF NON-GM CROPS AND CENTRES OF ORIGIN:

GM crops are living, breeding, mutating organisms capable of spreading throughout their ecosystems. They can cross-pollinate with neighbouring crops or wild relatives. Centres of origin, for example for sorghum or millet, are genetic reservoirs where wild relatives live. They are important for future breeding that will be needed to adapt to climate change. These need to be protected from GM contamination. Traditional crops and farmers' varieties will also be contaminated. Contamination also has implications for farmers who are providing to non-GM or organic markets and could lose their livelihoods.

GMOS ARE NOT APPROPRIATE FOR SMALLHOLDERS

GMOs are an extension of the "Green Revolution" package, which uses hybrid seed, synthetic fertilisers and agro-chemicals. These seeds may yield well under ideal conditions, such as regular irrigation and application of fertilisers. Yields reduce significantly when this exact and timely application of inputs is not met. Many farmers cannot afford these inputs.

GMO seeds must be bought fresh every year for several reasons, including:

1. Saved hybrid seed does not grow with the same vigour and characteristics as the first generation,
2. There are intellectual property rights on GMO seeds, making it illegal for farmers to save and replant or share seed,
3. The GM traits in recycled seed may be lost or even help create quicker insect resistance.

GM seeds are more expensive than conventional seed, require costly inputs and specific, often unrealistic, management procedures for smallholders². Farmers may not save or share seed, making them dependent on seed and agrochemical corporations. If farmers don't have enough money for these inputs there is no safety net. Loans for inputs can put farmers in debt if they cannot sell their crop for the right price or if it fails for any reason.

It is preferable for farmers to have access to seed that is specifically bred for local conditions and may be recycled and shared. Diverse and locally adapted seeds and crops are vital for climate change because they are flexible and resilient. More than 80% of Africa's food is grown by smallholders (predominantly women) using farm-saved seed. More intense support for farmers' seed and seed systems will lead to diverse and nutritious diets, and diverse seeds that can adapt to climate change.

In 2008 the International Assessment of Agricultural Knowledge, Science and Technology for Development (IAASTD) found that narrow research and policy focus on increasing yields and on expensive, short term technical fixes like GMOs, does not address the root causes of poverty and hunger. Instead, they said, it diverts scarce resources away from more robust and appropriate solutions, can increase inequality and cause environmental harm. The IAASTD research was carried out by more than 400 scientists in 80 countries over four years. The research was funded by UN Environment Programme (UNEP), FAO and the World Bank. Amongst their many recommendations, they identified a need for governments to invest in research and policy to further agroecological and resilient farming methods.

GMOS CONTRIBUTE TO CORPORATE CONTROL OF THE FOOD SYSTEM

The "Big Six" mega seed and agrochemical corporations - BASF, Bayer, Dow, DuPont, Monsanto and Syngenta - together control 75% of the global agrochemical market, 63% of the commercial seed market and over 75% of all private sector research and development in the sector. At the moment, three global agribusiness "mega mergers"

are happening - in the seed and agrochemical sector between ChemChina & Syngenta; Dow & DuPont; and Bayer & Monsanto. Greater dependence on fewer seed and chemical companies threatens healthy competition in the sector and reduces farmer choices. This situation is also eroding agricultural and nutritional diversity because big seed companies only focus on commercially viable commodities. The whole system makes communities economically vulnerable to hunger and puts the entire food system at risk of collapse in the context of disease outbreaks and climate change.

Zambia has already experienced the loss of public and local seed entities to agribusiness giants, with Syngenta acquiring MRI Seed Zambia in 2013 and Monsanto acquiring large parts of SeedCo. There are rumours of the remaining seed companies Zamseed and Komano also being taken over.

GMOS RESTRICT ACCESS TO MARKETS

Genetically modified crops are controversial all over the world. Consumer rejection is high, leading to more than 64 countries requiring GM labeling to give consumers choice. Import and export of GM crops requires complex regulation. For example, in the European Union, all GMOs must be authorized before they can be marketed and individual countries may choose to restrict or prohibit GMOs in their territory. In 2018, American maize farmers had their shipments to China cancelled because millers could not secure permits to process GMOs. China turned to the Ukraine for non-GM maize instead. Most African countries do not allow import of GMOs. For example, South Africa drastically reduced its options for export markets for its 2017 white maize bumper harvest, in Africa and elsewhere, due to the fact that it is GMO.

Zambia's GM-free status provides a competitive advantage as the country seeks to position itself in the global market. Once GMOs are allowed to be cultivated, contamination is inevitable along with potential loss of markets. Opening to GMOs is also opening to massive influx of GMO commodities from other countries, which has the potential to undercut local farmers.

2. Farmers have always been required to sign contracts promising to plant "refugia" with Bt crops. That is, a percentage of their crop must be non-GM to slow down the pests ability to build resistance to the Bt toxin. In the context of limited land availability, costs and close proximity of neighbouring fields, ensuring adequate refugia has proved very problematic.

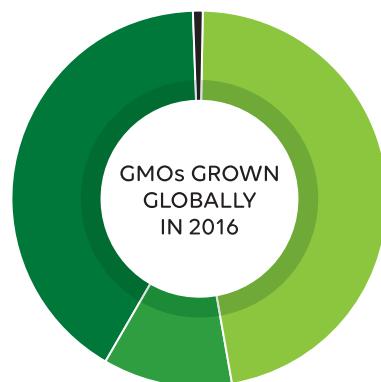
3. WHAT GMOS ARE AVAILABLE IN THE WORLD TODAY?

In the 1990's the biotech industry made fantastic promises about the benefits of GMOs. They said they would create crops with increased nutrition, taste and shelf life, adaptability to salty soils, drought and much more. However most of these were never achieved - after 20 years, most GMO crops are either pest resistant, herbicide tolerant or a combination of both.

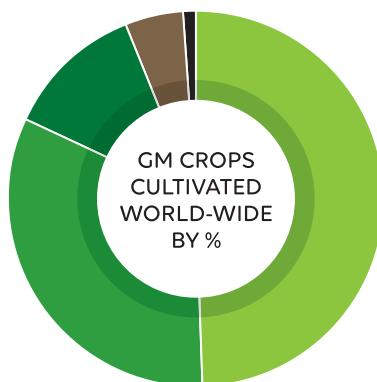
GM TRAITS ON THE MARKET TODAY:

1. "Bt" crops produce their own pesticide through the insertion of genes taken from a soil bacterium called *bacillus thuringiensis* (Bt). The toxin targets certain caterpillars, including bollworm and stem borers. Bt crops are called insect resistant crops.
2. Herbicide tolerant (HT) crops can withstand applications of herbicides. This means that farmers can spray their fields with poison to deal with weeds and not worry about killing their crop.
3. "Stacked varieties" contain both of these traits, so they are both insect resistant and herbicide tolerant.

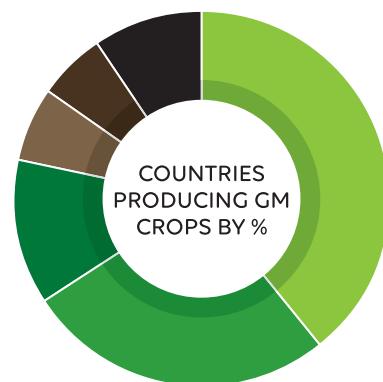
In 2016 47% of all GMOs grown worldwide were herbicide tolerant. 11% were insect resistant. 41% were stacked (herbicide tolerant and insect resistant). The remaining 1% were other types, including virus resistant. Adding herbicide tolerant and stacked varieties together, we can see that 88% of all GM crops grown in 2016 were designed to be sprayed with herbicides. The companies that own the GM seed also own the herbicide. Increasing herbicide sales through GM crops has been a very successful business strategy for the seed companies, despite increasing awareness of linked health problems.



47% HERBICIDE TOLERANT (HT)
11% INSECT RESISTANT (IR)
41% STACKED (HT & IR)
1% OTHER



50% SOYBEAN
33% MAIZE
12% COTTON
5% CANOLA
1% OTHER



39.4% USA
26.5% BRAZIL
12.6% ARGENTINA
6.3% CANADA
5.8% INDIA
9.4% OTHER

GM CROPS ON THE MARKET TODAY

Very few GM crops are available today. They are predominantly global commodities - maize, soya, cotton and canola. If these crops are meant to feed the world as the proponents claim, we are at dire risk of malnutrition from such a diet!

COUNTRIES THAT ARE GROWING GM CROPS TODAY

The biotech industry will also have us believe that cultivation of GM crops is the norm. African countries are said to be "lagging behind" and urgently need to catch up with modern technology. However, just 3 countries – USA, Brazil and Argentina – were responsible for 78.7% of all GM crops grown in 2016. In contrast, 64 countries require GM foods to be labeled, an indication of the widespread consumer rejection of GMO across the globe. Zambia's non-GM status gives it a competitive advantage in the market because many countries will not accept GMOs

Over the last twenty years we have come to realize that the potential of GMOs is incredibly limited. We need to ask,

- Does GM technology address the real needs of Zambian farmers?
- Do GM crops cater for our diverse nutritional needs?
- Is Zambia really "lagging behind"?
- Is the risk to health, environment and Zambia's export market options worth it?

4. BURKINA FASO'S FAILED BT COTTON

Burkina Faso is 1 of 3 African countries that has cultivated GM (Bt) cotton to date, beginning in 2008. In the first years, yields increased and Monsanto created "seeing is believing tours" for government officials and the media to witness the benefits. (Monsanto had already employed the same strategy in South Africa in the late 1990's/ early 2000's in the Makhathini Flats. This was a flagship project to prove that GMOs could indeed benefit African smallholders. That project ended in the financial ruin of many farmers when the local credit institution collapsed under the weight of unpaid loans to the tune of about R22.7 million (approximately US\$2 million) in 2004.)

While Burkinabe farmers did report an initial increase in yields, the GM cotton was dogged by quality problems from the start. For some reason, the GM variety produced short fibres, which are difficult to process. This led to downgrading of Burkinabe cotton, which has always been famous for its excellent quality. It damaged the

image of the cotton industry and of course made it difficult to get good prices. Despite all attempts, Monsanto was unable to fix this quality problem. By 2017 the cotton industry announced that they would phase out the use of GM cotton. Initially the industry demanded about US\$76 million in damages from Monsanto, but this was eventually settled out of court in 2018. This change in quality is yet to be explained – was it a function of the conventional breeding or the result of inserting foreign genes?

Due to the failure in Burkina Faso, Monsanto withdrew their funding for field trials in Ghana where commercialization of Bt cotton was imminent. Despite these problems and the lack of scientific explanation of how GM affected quality, Nigeria has recently given the green light to GM cotton and many other African countries remain keen to commercialize as soon as possible.

5. GMO'S – THE NEXT GENERATION

While many African countries are still preparing to adopt "first generation" GMOs, the technology has moved on new biotechnological tools to manipulate the genes of an organism are developed. This new era is being referred to as GMO2.0. According to the African Centre for Biodiversity (ACB), "GMOs 2.0, in general, involve many of the same processes used to produce first generation GMOs. These techniques come with similar, attendant risks and have also introduced additional risks."

These new tools involve targeted changes to genetic material (as opposed to the more hit-and-miss changes created in first generation GMOs). They include RNA-

mediated DNA methylation, agroinfiltration, grafting, reverse breeding, and genome editing techniques (CRISPR and gene drives, TALENS and oligonucleotide-directed mutagenesis).

It is beyond the scope of this fact sheet to delve into explanation of these complex technologies³. However, what is important is that the biotech industry is arguing that these new techniques must not be regulated by current GMO laws and risk assessments. However, biosafety analysts, civil society organisations, scientists and legislators have raised concerns about the potential risks GMO2.0 may pose to health and the environment.

3. See papers from the ACB for further information: Biosafety Risks of Genome Editing Techniques in Plant Breeding.

<https://acbio.org.za/wp-content/uploads/2017/03/Gene-Editing-report.pdf>

Biosafety Considerations of Novel Plant Breeding Techniques. <https://acbio.org.za/wp-content/uploads/2017/03/Plant-Breeding-report.pdf>

6. CONCLUSION

If we are to face climate change and to deal effectively with environmental degradation, poverty and hunger, it is vital to invest in farming systems that are designed to create resilience and social equity. Unlike industrialised agriculture and its new extension – GMOs - an agroecological approach recognizes the multifunctional dimensions of agriculture and helps to fulfil a broad range of equitable and sustainable development goals. Agroecology includes a wide variety of technologies, practices and innovations, including local and traditional knowledge as well as current scientific knowledge.

The Zambia Alliance for Agroecology and Biodiversity agrees with the IAASTD finding that GMOs have primarily benefited transnational corporations and the wealthy, rather than the poor and hungry of the world. The IAASTD found little solid evidence to support claims that GMOs have contributed to equitable or sustainable development or will do so in the future, but instead raised substantial questions about their social, health and environmental impacts.

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ZAAB is a network of faith, farmer and civil society based organisations, who collectively advocate for biodiversity, agroecology, food sovereignty and social and environmental justice for Zambia. ZAAB members focus on raising awareness and endeavour to help shape an enabling policy environment to ensure the most sustainable future for all of the country's citizens.

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